

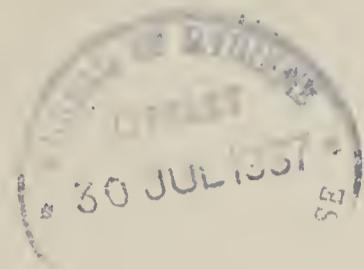
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**ANNUAL REPORT
OF THE
SUDAN VETERINARY SERVICE
1936.**

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ANNUAL REPORT
OF THE
SUDAN VETERINARY SERVICE
FOR 1936

With the compliments of
The Director
Veterinary Service, Sudan Government.
Khartoum.

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S T A F F E

The distribution of the British staff at the end of the year was as follows :-

N A M E	DESIGNATION	S T A T I O N
Captain H.B. Williams, O.B.E. M.R.C.V.S., 4N.	Director	Khartoum
Dr. S.C.J. Bennett, D.Sc., M.R.C.V.S. 4N.	Asst. Director and Senior Research Officer	Khartoum
Mr. J.T.R. Evans, B.Sc., M.R.C.V.S.	Veterinary Research Officer	Malakal
Captain J. Going, M.R.C.V.S., 4N.	Veterinary Inspector	Khartoum
Captain C.P. Fisher, M.R.C.V.S., 4N.	"	El Obeid
Major J.R. Ellison, M.R.C.V.S., 4N.	"	Malakal
Captain T. Menzies, D.V.S.M. (Vict.), M.R.C.V.S., 4N.	"	El Fasher
Captain L.E. Prichard, O.B.E., M.R.C.V.S., 4N.	"	Wad Medani
Mr. W.H. Glanville, M.R.C.V.S.	"	Khartoum
Mr. J.E. Furney, M.R.C.V.S.	"	Wau
Mr. J.A. Gillespie, M.R.C.V.S.	"	Kassala
Mr. A.W. Chalmers, M.R.C.V.S.	"	Kosti
Mr. P. Durran, M.R.C.V.S.	"	El Obeid
Mr. R.H.A. Merlen, M.R.C.V.S.	"	Wad Medani
Mr. H.A. McLoghry, 5N.	Superintendent	Khartoum
Mr. P.A.C. Kenny, F.R.M.S.	Laboratory Assistant	Khartoum
Mr. C.B. Barrett	Chief Storekeeper	Khartoum

The designation of Dr. S.C.J. Bennett was altered from "Veterinary Research Officer" to that of "Assistant Director and Senior Research Officer".



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The cadre of Veterinary Inspectors was increased by one, and Mr. H.F.A. Merlin was appointed to the vacancy on probation on 13-9-1936 and posted to Blue Nile Province.

Twelve Native Stock Inspectors and two Head Laboratory Attendants, who hitherto held unclassified posts, were promoted to Scale "X" posts and their designations changed to that of "Head Stockmen".

The following transfers took place during the year :- Captain G.P. Fisher from White Nile Province to Kordofan; Mr. J.A. Gillespie from Darfur to Kassala; Captain T. Monzies from Kordofan to Darfur; Captain S. Goings from Kassala to Khartoum; Mr. A.W. Chalmers from Blue Nile to White Nile.

The Director visited Blue Nile, White Nile, Kordofan, Darfur and Northern Provinces, in order to consult the Governors and Veterinary Inspectors regarding local problems; to investigate the possibility of instituting centres for the instruction of tribal and other officials in the elements of such animal industry as might be locally developed; and also to assess the results of the horse breeding and improvement schemes which have been in operation for the past eleven years.

The Assistant Director attended the Conference on the Co-ordination of Veterinary Research in East Africa at Nairobi, and the Conference on Co-ordination of Tsetse and Trypanosomiasis Research at Entebbe. He also took the opportunity while in Uganda of making enquiries concerning native professional education, both veterinary (at the Veterinary School incorporated in the Veterinary Research Laboratory at Entebbe), and medical (at the Medical School attached to the Mulago Hospital in Kampala). A visit was also paid to Makerere College, Kampala, where "vocational" courses, embracing special pre-professional subjects for students destined for various professional schools, have been instituted. On his return journey he interviewed the Governor, Equatorial Province, the Governor, Upper Nile Province, and inspected the Malakal Veterinary Laboratory and Training Centre.

SECTION I.

DISEASES OF ANIMALS

I. DISEASES OF CATTLE.

Rinderpest.

In Darfur, Kordofan and White Nile Provinces the disease became epizootic towards the end of December, 1935, and early in January of this year outbreaks were so widespread and involved such large numbers of cattle that, in order to conserve our small stock of prophylactics, Veterinary Inspectors were asked to restrict the use of rinderpest anti-serum to those herds in which its use could be economically justified. The heavy losses

... which occurred

which occurred in untreated herds would undoubtedly have been greatly lessened had cattle owners resorted to the quarantine methods employed before the coming of prophylactics, but they have during the past few years become so accustomed to having their cattle inoculated immediately rinderpest appears, that this year, when owing to the widespread nature of the epizootic all demands for serum could not be met, many of them made no attempt to quarantine their herds. Cattle owners must be made to realise that it may not always be possible, either on economic grounds or owing to lack of prophylactics, to treat all outbreaks and, therefore, it is essential that they should still in all cases, on the first appearance of disease in their herds, put into operation the quarantine measures on which they had to rely before the coming of sera and vaccines.

The Senior Veterinary Inspector, Kordofan, reports that despite the receipt of 34,000 doses of rinderpest serum and 42,500 doses of rinderpest vaccine the supply was not equal to the demand. He is, however, of the opinion that there are already some areas, as for instance the Eastern grazing grounds of the Messeria tribe, where there is already a shortage of grass due to over-stocking, and is rightly of the opinion that the use of prophylactics in such areas will have to be carefully studied.

No returns are available for the cattle inoculated with serum issued for use in Equatorial Province. There is an increasing demand for prophylactics from the Southern Provinces, but for economic reasons their extensive use there does not, as yet, appear justified.

The Laboratory output of serum, with which over 150,000 head of cattle of all ages were serumised, totalled approximately 124,000 full doses.

The production of cattle plague vaccine on a large scale luckily coincided with what may be called a "rinderpest year". The total output of over 130,000 full doses as compared with 41,000 odd in 1935 was used in supplementing our serum supply in the field, with consequent lessening of casualties. As the Senior Research Officer in his 1936 report deals fully with the method of production of the vaccine and its use in the field, it is only necessary to mention here that the Baggara tribes already appreciate its value and accept it as readily as serum.

Contagious Bovine Pleuro-Pneumonia.

The Senior Veterinary Inspector, Darfur, reports that the disease became epizootic in his Province during the early part of the year, outbreaks being reported from all Baggara districts. The Arabs now realise the value of vaccine and immediately report outbreaks but, as in past years, the greatest difficulty has been experienced in getting them to destroy their infected beasts. Until they appreciate the necessity of doing this, little headway can be made in freeing the country of this insidious disease. Some eleven thousand doses of vaccine were used in Darfur.

Thirty-eight small outbreaks which occurred in Kordofan were effectively treated with vaccine.

In White Nile Province many outbreaks occurred in the vicinity of Kosti, chiefly amongst trade cattle. It is considered that infection was introduced by cattle coming from Darfur to Kosti for sale.

At the end of the year a number of deaths and large swellings occurred in trade cattle which had been vaccinated. The strain of vaccine in use at the time has been discarded.

Of 51,000 odd doses of vaccine issued from the Khartoum Veterinary Laboratory, a little over 12,000 were employed for the immunisation of trade cattle, and the remainder used in nomad-owned herds.

Trypanosomiasis.

This disease continues to appear in cattle of the Dinder feriks. During the year fifty-six cattle were reported to have died as a result of two severe outbreaks on the Dinder.

In Darfur the disease took its toll of those herds kept South too late in the rains.

Foot and Mouth Disease.

This disease made its appearance early in the year, the first outbreak reported commencing at Kosti in January and persisting until March. No further cases were reported until early in December, when the disease appeared in a herd of trade cattle grazing near El Obeid. Infection was found to have been introduced by cattle which had recently arrived from the West. The energetic measures adopted to prevent its spread were successful in protecting other cattle trade centres. Export of cattle from Kordofan was prohibited and Kosti and Shendi substituted for El Obeid as entraining points.

All trade herds around El Obeid rapidly became infected, but the disease ran its usual mild course entailing only slight loss of condition in the affected cattle, and it is anticipated that by the end of January (1937) a sufficient number of recovered cases should be available to allow of resumption of the export trade without danger of further spread.

The Baggara tribes pay so little attention to the mild form of foot and mouth disease prevalent in the Sudan that they can rarely be persuaded to report outbreaks, which makes it extremely difficult to keep the trade cattle, collected at entraining centres, free from the disease.

Anthrax.

No cases were observed during the year.

Mange.

Psoroptic mange is as prevalent as ever amongst working

bulls on the Gezira and is undoubtedly one of the chief contributory causes of the poor condition in which one so frequently finds these animals. The owners are apathetic and rarely report cases until in an advanced stage, and, unless constantly supervised, will not carry out the simplest precautionary measures. Pending the practicability of more radical measures, sale of affected beasts for slaughter and their replacement by clean beasts is undoubtedly the most economic form of control.

Anaplasmosis.

The Senior Veterinary Inspector, Blue Nile, reports that three cases occurred in his Province.

Haemorrhagic Septicaemia.

A positive case occurred at Gedaref.

2. DISEASES OF CAMELS.

Trypanosomiasis.

It has been customary for many years to withdraw Eastern Arab Corps and Police camels from posts where biting flies were known to be present during the rains, usually from June or July until the end of October, and to keep them in the neighbourhood of Kassala. This year, however, unusually heavy infection occurred whilst the camels were grazing in an area near Kassala hitherto considered comparatively free from fly. It is the opinion of Captain Going, late Senior Veterinary Inspector, Kassala, that tabanid flies greatly increased in the area during 1936 owing to abnormal rainfall and a gradual increase in afforestation.

The writer notes with regret the passing of the last of those picturesque Units, the Mounted Camel Companies of the Camel Corps, namely, No. 4 Company, which was mechanised during the year. It was in these companies that the first large scale experiments on the use of Naganol as a curative for trypanosomiasis were successfully carried out.

Altogether, 10,701 treatments (with Naganol) were carried out, and of these nearly 9,000 were in privately owned camels for which payment was made. That the popularity of treatment is increasing, and that private owners are still prepared to pay for it, is shown by the increased demand among the tribes of Northern Kordofan, where, as a result of demonstrations given last year, the number of privately owned camels brought up for treatment rose from under 1,000 to approximately 3,500.

/ Mange.....

M a n g e .

Has not been noted as being prevalent in the camel breeding areas of Kordofan and Kassala Provinces. Isolated cases, which occurred amongst Army and Government animals, were successfully treated by hand dressing, and the spread of infection prevented by constant movement of animal lines to fresh sites.

Contagious Necrosis.

Little should be heard of this disease now that Nos: 2 and 4 Companies, Camel Corps, have been mechanised. Previously it was epizootic at Bara, outbreaks occurring annually during the rainy season.

3. DISEASES OF EQUINES.African Horse Sickness.

Prior to 1936, officials of the Sudan Plantations Syndicate suffered heavy losses yearly amongst their horses from this disease. The mortality was especially high in the case of imported horses.

"Neuro vaccine", which is further mentioned in the Senior Research Officer's report, was used on a fairly extensive scale during the year, and appears to have given very good results. The Senior Veterinary Inspector, Blue Nile Province, who was the first to press for the use of this vaccine reports :-

"During the year, 397 doses of the "vaccine were used in the Gezira area, Blue Nile Province, and not a single case of horse sickness "occurred in a vaccinated animal, whereas many "cases occurred in untreated horses and mules in "other parts of the Province."

When the Sudan Horse left for the Upper Blue Nile at the end of October there was no opportunity to vaccinate the animals of the unit and it was anticipated that heavy losses from horse sickness might occur amongst the horses and mules. It may be considered extremely fortunate, from a veterinary point of view, that all animals were held up at Roseires for many days, as, during the time they were there, ten cases of a sub-acute form of horse sickness developed. Their recovery may be attributed to early detection and the fact that they could be rested and nursed. In addition, a further fifty horses showed high temperatures and a rapid falling off in condition. No specific cause could be found for this small epizootic.

The horse-owning tribes of Darfur and Kordofan say that their losses from horse sickness were extremely light during the year, despite the fact that the rains were heavier than usual in both Provinces.

Epizootic Lymphangitis.

This disease was definitely diagnosed at the Veterinary Research Laboratory from material forwarded from thirty-three horses and mules.

Of the twenty-four diagnosed cases reported from Blue Nile Province the majority occurred in Police horses and mules of the Fung district, where Police lines, despite precautions, continue to become infected. Fresh infection is undoubtedly constantly brought in by transport mules carrying merchandise from across the frontier.

The horse-owning tribes of the Western Provinces report that few cases have occurred amongst their animals.

Equine Influenza.

Cases of benign, though highly contagious, form of influenza, first noted in March, 1935, continued to occur in the Sudan Horse until February of this year. A provoking occurrence was the number of animals that appeared to become re-infected shortly after recovery.

4. DISEASES OF CANINES.

R a b i e s .

Of the 120 brains of animals submitted to the Stack Memorial Research Laboratory for diagnosis, 40 proved to be positive. In addition to 33 dogs, this number included five donkeys, one cat, and one sheep. The following table shows the seasonal and topographical distribution of the positive cases:-

Province	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Blue Nile	2	3	1	2	4	2	2	2	2	2	2	2	14
Northern	1	2	1	1	1	1	1	1	1	1	1	1	5
Khartoum	2	1	1	1	1	1	1	1	1	1	1	1	3
Kassala	1	1	1	1	1	1	1	2	1	1	1	1	7
White Nile	1	1	1	1	1	1	1	1	1	1	1	1	3
Kordofan	1	1	1	1	1	2	2	1	1	1	1	1	6
Equatorial	1	1	1	1	1	1	1	1	1	1	1	1	2
Darfur	1	1	1	1	1	1	1	1	1	1	1	1	1
Upper Nile	1	1	1	1	1	1	1	1	1	1	1	1	1
Total	6	5	4	1	3	6	6	2	1	2	1	3	40

It will be seen that no cases were diagnosed in Darfur and Upper Nile Provinces, although several suspicious cases were reported from them. It might also appear from the above table that the disease was less prevalent than in 1935, when 61 cases were diagnosed. The latter conclusion, however, should not be drawn without considerable reserve, since many suspected cases continue to be reported from out-districts where facilities do not exist for the collection of material for diagnosis, and it is therefore impossible to estimate the number of actual rabies cases at issue.

SECTION II.

TRADE IN LIVESTOCK & LIVESTOCK PRODUCTS.

1. EXPORT & IMPORT TRADE

Cattle and Sheep.

Cattle exports to Egypt, at 10,471, valued at £E.44,791, were over two thousand head down compared with last year. Demands were steady and prices good throughout the year, but cattle owners in some of the districts from which cattle are usually purchased for export during the period January-August were apparently over-prosperous and therefore reluctant to sell their marketable beasts except at price which would not permit of a remunerative return to the merchants engaged in the export trade.

In 1935 one thousand head of cattle purchased in the Nasir district of the Upper Nile Province were successfully marketed in Egypt. This year merchants were again anxious to purchase in the same locality and, therefore, arrangements were made to hold a series of cattle fairs at central points in Nasir district. The fairs were a complete failure, the reason apparently being that the cattle owners had made sufficient

money by the sale of cattle in 1935 to pay their light taxes and supply their small wants for more than one year. If their needs, outside taxes, are only the odd mosquito net, a few spear heads and tobacco, then they should still have sufficient money in hand to prejudice the success of cattle fairs for even another year.

The Baggara Arabs of the White Nile have been unwilling to sell their big bullocks at under £E.4 a head. The sale of grain and simsim has supplied all their monetary needs for the year.

The number of sheep sent to Egypt fell from 19,511 head in 1935 to 11,110 this year. Demands from Egypt were steady at last year's level of prices, but the upward trend of prosperity in this country caused an increased demand for sheep for local slaughter, and thus there was a diminution in the number of good sheep coming on the local markets which could be bought for export at reasonable prices.

Further details of the trade in cattle and sheep are given in the following tabulated statements :-

A. Numbers and values of cattle and sheep exported during the last four years :

Year	Cattle	Sheep	Value at port of export
1933	5,518	4,963	£E.24,210
1934	8,963	15,642	50,311
1935	14,596	21,568	84,765
1936	10,471	11,110	56,517

B. Numbers of cattle imported during the last four years.

Year	French	Equatorial	Eritrea	Abyssinia	Total
1933	401	20	782	1,203	
1934	3,437	-	821	4,258	
1935	5,764	-	1,662	7,426	
1936	1,754	-	1,181	2,935	

C. Origin of cattle exported during the last three years.

Province	: 1934	: 1935	: 1936
Kordofan and Darfur	: 6,228	: 5,684	: 6,088
White Nile	: 540	: 3,300	: 1,721
Upper Nile & Equatorial.	: 455	: 1,144	: 338
Khartoum.....	: 426	: 480	: 198
Blue Nile.....	: -	: 200	: 347
Northern.....	: 1,020	: 2,100	: 1,400
Kassala.....	: 20	: -	: 13

D. Average market prices and total number of cattle sold for export in El Obeid market during the last four years.

Year	: Number of cattle sold	: Average price
1933	: 2,355	: £E.1.376 $\frac{1}{2}$ s
1934	: 1,789	: " 1.810 $\frac{1}{2}$ s
1935	: 6,759	: " 2.087 $\frac{1}{2}$ s
1936	: 7,002	: " 2.333 $\frac{1}{2}$ s

Camels.

In view of last year's heavy exports, when, owing to abnormal sales in Eritrea and good demands from Egypt, exports must have exceeded 40,000, the camel-owning tribes have done well in disposing of approximately 23,000 camels in Egypt this year. Demands from Egypt have been steady and camels have sold well, though not at the "boom prices" of last year. Over fifteen thousand of the camels exported reached the Egyptian markets during the first half of the year, and the remainder during the period October-December. None were marketed during the rains, i.e. July-September.

The average prices realised by Sudan camels on the markets of Upper Egypt and Cairo district were :-

Transport Animals	£E.6.500 $\frac{1}{2}$ s
Young animals for fattening & breeding....	" 4.500 $\frac{1}{2}$ s
Slaughter - Males and barren Nagas in prime condition.....	" 7.500 $\frac{1}{2}$ s

The condition of the camels on arrival in Egypt was better than usual as, following the good rains of 1935 and 1936, there was excellent tree browsing in the camel areas, and also this year's exceptional rains in the North made conditions on the long trek to the markets of Upper Egypt far easier than for many years.

Mules.

It has been customary to purchase the Sudan Defence Force and Civil remount mule requirements at Gallabat in January and February of each year, but this year, owing to disturbed conditions prevailing across the Frontier, it was considered that mules would not be available for purchase and, therefore, arrangements were made to experiment with the use of Sudan country-bred horses in localities previously considered unsuitable for them.

Hides and Skins.

The hide market, which had been sluggish for some considerable time, improved towards the end of 1935, and from then until November of this year, when increased orders from abroad caused a sharp rise in prices, both demands and prices remained steady.

The total weight and value of hides exported show a welcome increase over the 1935 figures, $1462\frac{1}{3}$ metric tons valued at £E.69,014 being shipped as compared with $1226\frac{1}{2}$ tons valued at £E.45,768 in 1935. Egypt and Syria remained our best customers, taking respectively $619\frac{1}{2}$ and $594\frac{1}{3}$ metric tons.

The fact that so many more hides have been exported may be partly attributed to a large flow to our markets following the epizootic of rinderpest which swept across the Sudan, from West to East, during the year. In addition, a rise in price has made it profitable to market from more remote districts.

Periodic visits to Omdurman hide dealers' premises, and inspections of hides from the South on arrival by steamer, show that there is a noticeable increase in the percentage of hides prepared by improved methods coming on the market. In this vast country, with its scattered animal population, improvements affecting animal industry appear painfully slow compared with what occurs in other countries of lesser areas and denser animal concentration. Nevertheless progress is being made, and, provided all administrative officials continue to give us their assistance in driving home to those cattle owners and native administrations with whom they come in contact, the fact that both the country and the producers will ultimately benefit if a little care is taken over the flaying and preparation of hides, and the improved type is turned out in quantity, this progress will continue.

Increased use has been made of the Malakal Veterinary Laboratory as a centre for training Southern tribal retainers in the curing of hides and other branches of animal husbandry.

It is shortly intended to demonstrate and give instruction on animal industry, including hide preparation, at places within reach of all in the Baggara areas of the West. These demonstrations, it is hoped, will be attended by native tribal officials, tribal veterinary retainers and others interested, and, in addition, the presence of the district Political Officers will always be appreciated as it is on their help that we chiefly rely for ensuring that tribal administrations pull their weight and that our tribal retainers carry out their duties.

There is probably scope for great improvement in Animal Industry in some areas of the Fung districts. In particular the hide and samn (clarified butter) trades call for "fathering" by this Service. The Senior Veterinary Inspector, Wad Medani, has already arranged for numerous demonstrations on flaying and preparation of hides, and data are being obtained of those centres which have a seasonal surplus of milk with a view to the development of creameries at which samn will be made. There appears to have been a marked increase of recent years in the number of cattle owned by the Fallata of Northern Fung district. The Fallata wherever they are to be found are our best pupils where we teach improved methods of animal husbandry, especially if there is money in any of the suggested improvements. They have an eye to business and realise more quickly than the Baggara tribes that a well prepared hide is of more value than a dirty ground dried one.

The sheepskins market remained depressed until September when the tide turned and increased demands from America resulted in a rising market until the end of the year. December's shipment to America totalled over 110 tons.

This year's shipments of approximately $848\frac{1}{2}$ tons, valued at £E.50,844, though slightly less than last year's, were valued at some £E.4,000 more, England, who has not been a large buyer for some years, took over 105 tons. America remained our biggest customer, taking over 586 tons. Until increased prosperity comes to that country and there is more money to be spent on luxuries, there can however be little hope of a real boom in the sheepskin trade.

The quantities of hides and skins exported during the last five years and the average values per ton were as follows :-

Year	Hides			Skins		
	Tons		Average value	Tons		Average value
	per ton	£. E.	per ton	£. E.	per ton	£. E.
1932	712	16.3		862		45.4
1933	1,207	30.0		1,057		48.9
1934	1,115	31.2		1,168		67.6
1935	1,226 $\frac{1}{2}$	37.3		991		54.9
1936	1,462	47.2		952		61.1

Samn or Masilee (Clarified Butter).

The year's exports of $706\frac{1}{2}$ tons show a drop of $190\frac{1}{2}$ tons compared with those of 1935, due mainly to the fact that last year's abnormal demands from Eritrea declined on the cessation of hostilities in Abyssinia. There are, however, possibilities of a small regular trade being maintained with Eritrea. Egypt, in normal times always our best customer, made record purchases totalling approximately 500 metric tons - five sevenths of the total exports.

Should a simple method of preparing "clarified butter" direct from cream, which has been experimented with in Tanganyika, prove adaptable to this country, it may be found possible to utilise a large proportion of the surplus milk produced in the Baggara districts during the rains in preparing a first grade product for the export market. The Veterinary Service proposes, during 1937, to carry out a preliminary survey of some of the areas in which the improved method might be profitably operated.

II. INTERNAL TRADE.

Slaughterings in the ten largest towns of the Sudan were more or less the same as last year, except in the case of sheep which showed a 10% increase. Reports point to a still larger increase in the number of sheep killed in the smaller towns and villages, but it is impossible to obtain full records of these. When times become more prosperous in rural districts one of the first luxuries indulged in is an increased meat ration, and, as cattle cannot be economically slaughtered by small communities, the increased demand falls on sheep and, failing that, goats.

Numbers of animals slaughtered during 1936 in the following ten towns :-

Town	: Camels :	Cattle :	Sheep :	Goats
Khartoum.....	: 13 :	2,477 :	32,333 :	78
Khartoum North.....	: 2 :	836 :	9,606 :	185
Omdurman.....	: 184 :	5,652 :	39,114 :	1,108
Wad Medani	: 613 :	2,519 :	18,202 :	219
El Obeid.....	: 178 :	4,960 :	12,366 :	359
Atbara.....	: 28 :	1,311 :	13,843 :	-
Kassala.....	: 228 :	1,197 :	16,630 :	739
Gedaref.....	: 243 :	1,327 :	4,758 :	176
Wadi Halfa.....	: 1 :	262 :	4,510 :	205
Port Sudan.....	: 107 :	1,722 :	19,971 :	4,863
 Total	: 1,597 :	22,263 :	171,333 :	7,932
Total for 1934	: 1,277 :	21,325 :	169,153 :	6,243
" " 1935.....	: 1,478 :	21,548 :	153,766 :	7,893

The foregoing notes and table are concerned only with animals slaughtered for food in areas in which meat consumption has been long established. While in no way complete, the figures quoted are at least an indication of whether slaughter for food is engaged in an upward or downward movement; a slight movement in the "indicator" centres implies a much greater movement in the rural districts.

The time has now arrived when the extension of the consumption of meat to some hitherto non-meat-eating areas can also be considered. For example, now that cotton is being grown in the Yambio district of the Equatorial Province, the Zande of that area are gradually acquiring sufficient money to make purchases from outside their own immediate neighbourhood. One of their great requirements, and simultaneously one of their great cravings, as is shown by their anxiety to buy it whenever available at reasonable prices, is meat. Owing to the existence of tse-tse areas on all sides of their settlements it is not, as yet, practicable to consider the herding of food animals in the neighbourhood for more than minimal periods, but it may prove practicable to institute some form of regular supply service based on the Dinka grazing lands to the North of the "fly" areas.

One school of thought was of the opinion that attempts should be made to supply the meat deficiency in the form of "biltong", which could be produced in the Dinka areas and delivered by motor transport. Endeavours along this line, have, however, not proved very successful, largely on account of expense, since in preparing "biltong" a large amount of edible material must be discarded which would be available for consumption if the cattle could be locally slaughtered. Furthermore, it is certain that "biltong" can never be regularly supplied, since local climatic conditions (high relative humidity throughout a large part of the year) are unsuitable for the storage, and usually even for the original preparation, of this article. The possibility of delivering live cattle is therefore being investigated, but, even if it is found possible to protect them in transit through the fly belts, the problem of inducing the neighbouring Dinkas to part with their cattle will still remain for solution.

SECTION III.

IMPROVEMENT OF LIVESTOCK

Cattle.

At present our efforts to improve the type of cattle are limited to castrating as many unsuitable bulls as possible and encouraging the introduction of new blood into certain tribal herds. While this procedure is undoubtedly having good results, there is a danger that some of its benefits will be - if they are not already - mitigated by overstocking. With the increased output of cattle plague prophylactics and advancing

/ control of....

control of contagious bovine pleuro-pneumonia there is a real danger that certain areas may, in the not distant future, become overstocked. A contributory factor may well be that essentially pastoral tribes on whom agricultural pursuits are only beginning to impinge may invest the profits of cultivation in livestock. The following extract from a report submitted by the Senior Veterinary Inspector, Kordofan Province, gives a reasoned exposition of the situation in one of the areas concerned :-

"The question of overstocking in Dar Messeria is one that seems to need consideration. There are indications that the money that is being made from cotton is being put into cattle, bought chiefly from Rezeigat.

"Already one hears complaints that there is not enough available grazing, and this in a year of good grazing conditions. In other colonies (Kenya) the situation has become extremely acute in the stock areas of the native reserves. The stock have deteriorated and the large majority of the population has no milk for themselves or their children during the dry months of the year. "In the midst of plenty, the natives of pastoral and semi-pastoral areas, are, in fact, living under conditions of extreme poverty." (Kenya Land Commission Report 1933 p.494).

"We are a long way from this state of affairs in Dar Messeria, but at the same time, we are, at the moment, heading towards a state of being overstocked. "To give the tribe more land may not be the answer; it may only lead to the process being repeated. An education, such as would lead the Arab to regard his cattle in terms of their economic value, rather than of dowries and social status, seems to be what is required.

"Even the withholding of prophylactics may not prevent an area like Dar Messeria, subject as it is to extraneous influences (the investing of cotton money in cattle from another Dar) from becoming rapidly overstocked.

"Every effort should be made to persuade the cultivators to invest their money in other things besides cattle, and it might even be worth considering whether the abolition of the herd tax, as such, has had any effect in encouraging this form of investment.

"A point which it is necessary to keep before one's mind in relation to overstocking, is the possibility of the tribute figures for cattle being less accurate than the old herd check figures, and that they may tend to decrease annually. The reason for this is that the tribute taxation is regulated, in so far as the native authority is concerned, by men who are, first and foremost, cattle owners. This is a view which is not generally held, but it seems a possibility worth keeping in mind."

/There is.....

There is as yet no question of the output of disease prophylactics being in excess of the country's requirements, and disease still takes a heavy toll of cattle in most areas. Nevertheless it is not too early to insist that the potential danger of overstocking should henceforward be regarded as a real factor in our policy of disease control.

Horses.

At the four horse shows held in Darfur in January and February some 7,040 horses, 3,182 mares and 796 foals were present. This does not by any means represent the total number of foals in Darfur, as only those which their owners claimed to be sired by Government or Tribal stallions were on show.

It has previously been our policy to restrict the purchase of remounts to horses between four and eight years of age, but this year, owing to increased demands for remounts, requirements could only be met by allowing the purchase of well-grown three-year-olds. This really did not matter a great deal as the majority were for the Sudan Defence Force, who did not put them into hard work until the autumn when they were four-year-olds, and during the intervening period they received far better feeding and general care than they would have done if left on their tribal pastures for another season.

The Veterinary Inspector, Darfur Province, considers that for many years the Baggara tribes have been completely stripped of all their best horses and that consequently there are not sufficient high quality stallions left for stud purposes. The small establishment of Government sires cannot possibly counterbalance this drainage of stallion power from the stock of the tribes and, therefore, with the Governor's concurrence, it is proposed to modify the breeding scheme so as to allow for a large increase in the number of tribal stallions at the expense of a reduction in the number of Government-owned Arabs. The cost of keeping an Arab stallion is approximately four times that of a tribal one.

From an analysis of the results of the working of the breeding scheme in Darfur for the past eleven years it is realised that the indiscriminate use of Arab sires leads to a high mortality in the resulting stock. The few pure-bred Arabs of known pedigree, which it is now intended to keep, will in future be stationed in selected districts where they will be most accessible to those breeders whom, from past experience, we consider best able to rear improved stock. From these breeders it should be possible to purchase most of our tribal stallions in future years.

The Senior Veterinary Inspector, Kordofan, comments on the small number of Arab-sired stock which reaches maturity. He states that the Arab sires are extremely popular and foals by them are seen in numbers, but three and four-year-olds rarely. It is therefore thought that, in Kordofan as in Darfur, a reduction in the number of Arab stallions will be advisable concurrently with an increase in the tribal ones.

The horse shows at Lagowa and Muglad were held in December. The former was not well attended, which may be excusable as the writer considers Lagowa an unsuitable centre

/ to which.....

to which to ask horse owners to bring animals, since it is remote from the breeding areas and considered unhealthy for animals. The fair at Muglad was a success. There were a large number of saleable stocky ponies present, all in grand condition, of which the Purchasing Officer bought 30 riders and 50 pack. The Humr ponies do not make good riders, but should prove useful in replacing Abyssinian mules, which are now unobtainable, for pack and draught work. The total purchases in Kordofan were heavier than usual and totalled 120, viz : 52 riders and 68 pack.

The thoroughbred stallions, Oberto, Viaduct and Singlass have been stationed at Khartoum and Shendi throughout the year. Their services totalled 128. Many of the progeny of these sires have been seen as foals, one, two and three-year-olds, but few survive with any degree of soundness after that age. We now know that stock sired by thoroughbreds can only be reared under artificial conditions on the banks of the Nile and that, even under these conditions, the expensive racing machine produced, in nineteen cases out of twenty, only survives for a few months the rigorous methods of training to which it is usually subjected at an early age by its native owner.

An early opportunity will be taken of discussing with those interested the economic value of the Government-owned thoroughbred sires in the Sudan. It may be found advisable to replace them by Arab sires.

SECTION IV.

EDUCATION.

Two ex-Gordon College boys were absorbed into the Service for instruction in Animal Husbandry and Animal Industry. It is proposed to give these students a two years' course of training and later to utilise them as "extension officers" to improve the quality of animal products and to establish closer contact between primary producers and exporters.

It is hoped that this small beginning will be only the first step towards a more comprehensive programme of veterinary education, whereby an adequate staff of highly trained Sudanese Veterinary Assistants will be built up.

/ SECTION V.

SECTION V.MISCELLANEOUS.Grazing and Water.

The rains in 1936 may be described as excellent throughout the pastoral areas of the Sudan and favourable grazing reports are to hand from all over the country.

The presence of good grazing in the North has afforded welcome relief to the pastoral tribes of the Northern Province, who have suffered considerable hardship for the past three years from the lack of pasturage for their flocks and herds, amongst which losses from starvation, particularly of young stock, were heavy.

The Western cattle were in splendid condition when the export trade opened in August, and 13 train loads of fat cattle left El Obeid before foot and mouth disease appeared in herds awaiting export, and necessitated a stoppage of the trade until the end of the year.

Veterinary Hospitals.

The following totals represent the number of sick animals treated, as out and in-patients, at the Khartoum and Wad Medani Veterinary Hospitals :-

Khartoum..... 10,024

Wad Medani..... 12,035

Until April of this year the work of the combined Military and Civil Forge in Khartoum was supervised by Farrier Instructor Holden who, although on the Sudan Defence Force Establishment, was entirely employed on duty with this Service. On his retirement in April it was found possible to economise the Sudan Defence Force post of a British Farrier by the substitution of a new post in the Veterinary Service for a Sudanese Farrier Instructor.

Four thousand one hundred and twenty-two pairs of shoes were fitted, and, in addition, nine hundred and seventy-seven animals had their hooves rasped, as compared with 2,825 pairs of shoes and unrecorded number of hoof raspings in 1935.

Government Animals.

The following table shows the number of animals for which forage allowance was drawn and the approximate percentage wastage from deaths and castings during 1936 :-

/ Horses.....

Horses	.....	1,172	Wastage	11%
Camels	.....	1,042	"	15%
Mules	.....	485	"	12%
Donkeys	.....	592	"	4%

The condition and general health of the above animals remained good throughout the year, as was to be expected in a year of good grazing and grain crops. Wastage was normal.

Reports from Veterinary Inspectors show that Government-owned animals, of which there are 99 horses, 170 camels, 407 mules, 190 donkeys and 299 bulls widely scattered over the Sudan, maintained good condition.

Sudan Defence Force Animals.

The 1936 establishment of animals was :-

1,316 horses, 563 mules, 465 camels, 15 donkeys and 54 bulls, a total of 2,413.

In general all these animals remained in good condition, the only two units in which any occurrence worthy of record developed being the Eastern Arab Corps and the Sudan Horse.

The camels of the Eastern Arab Corps were not in the big condition usually expected after the rains, during which period they were rested, and for this, continual re-infection with trypanosomes on grazing grounds normally free from this infection must be blamed.

The horses and mules of the Sudan Horse, although for most of the year in excellent condition, suffered appreciably from sub-acute African Horse Sickness and from some other undiagnosed fever during the month of October when they were stationed on the Upper Blue Nile.

Acknowledgments.

The writer again with pleasure records an appreciation of the help given this Service by Sudan Defence Force, Provincial and Departmental staffs. Their assistance and good will are essential if our small staff in the field is to meet with any measure of success in its efforts to control disease and effect improvements in animal industry in the vast pastoral areas of the Sudan.

Khartoum,
1-3-1937.

Sgd. H.B. Williams
DIRECTOR, VETERINARY SERVICE

SAM.

ANNUAL REPORT OF THE
THE SENIOR RESEARCH OFFICER.
SUDAN VETERINARY SERVICE
FOR 1936

A. STAFF AND GENERAL.

A number of changes have occurred in the classification and duties of the staff. The original "classified" staff of one senior and one junior Research Officer, one Laboratory Assistant, and one Clerk has remained. The Senior Research Officer has, however, been appointed Assistant Director, Sudan Veterinary Service, in addition to his existing duties, and two Sudanese Laboratory Attendants have been promoted to classified rank.

With a slight increase in the subordinate technical staff in 1936, it was hoped to recruit natives of the Southern Sudan for continuous service at Malakal. A certain number of Northerners will probably have to be sent during the working season for several years to come, but if the serum making staff could consist partly of local men a number of minor difficulties would be eliminated. Two such men were engaged, but only one was given more than a short trial; he proved, unfortunately, so unreliable that in spite of considerable patience exercised in his training he had ultimately to be dismissed. Two vacancies still exist, and it is still hoped to fill them with Southerners. Meanwhile, however, the existing Northern staff have to bear the extra burden.

In regard to duties, the main change has been that planned research has now been deliberately abandoned in order to devote the entire efforts of both the Khartoum and Malakal Laboratories to a maximum output of the various biological products issued therefrom. This development is in fact not so much an actual change as an official recognition of a situation that had already developed, and is, if routine duties are to continue at their present level, the only alternative to providing a larger senior staff and further laboratory accommodation.

Minor extensions have been made to both the Khartoum and Malakal Laboratories; in the latter mainly to facilitate the output of cattle plague vaccine, and in Khartoum with the object of not only handling cattle plague vaccine but also of providing a little more general accommodation that has been so badly needed during the past few years. So far as the Khartoum Laboratory is concerned, these minor extensions probably represent the limit of what will ever be justified on the present site.

In January and February the Senior Research Officer attended the Conference on the Co-ordination of Veterinary Research in East Africa at Nairobi, and the Conference on Co-ordination of Tse-tse and Trypanosomiasis Research at Entebbe. He also took the opportunity while in Uganda of making inquiries concerning native professional education, both veterinary (at the Veterinary School incorporated in the Veterinary Research Laboratory at Entebbe), and medical (at the Medical School attached to the Mulago Hospital in Kampala). A visit was also paid to Makerere College, Kampala, where "vocational" courses, embracing special pre-professional subjects for students destined for various professional schools, have been instituted. On his return journey he interviewed the Governor, Equatorial Province, the Governor, Upper Nile Province, and inspected the Malakal Veterinary Laboratory and Training Centre.

B. ROUTINE WORK

The main items have, as usual, been the preparation of cattle plague serum and bovine pleuro-pneumonia vaccine, the issue of diagnostic accessories and of naganol for the control of camel trypanosomiasis, and the examination of specimens. The preparation of cattle plague vaccine, which was first undertaken in the second half of 1935, was continued throughout the year.

I. CATTLE PLAGUE SERUM

In pursuance of the policy of aiming at maximum output, an effort was made to increase the amount of serum prepared at Malakal. In the past about 300 large serum-producing cattle had been kept in use over a period of about seven months, the number of cattle varying slightly in accordance with the size of beasts locally available, and the working period varying according to local climatic conditions. These cattle were submitted to six or seven hyperimmunisations, each followed by bleedings for serum, and were at the end of the season bled to death. The final bleeding-out, as it should be almost needless to record, yielded much more serum than any earlier bleeding. Since a larger number of cattle could not be maintained throughout the season, owing to limitation of grazing within practicable distance of the laboratory, and since the working season could not be prolonged on account of climatic conditions, the only procedure which promised a larger total output of serum was a second bleeding-out. This would entail the using up of double the number of cattle, introducing half of them at the beginning of the season, bleeding them to death after only three or four hyperimmunisations, and then repeating the process with the remaining half. Calculations extracted from the records of earlier seasons promised an increased serum yield of 20-25 per cent. at the expense of an increased cattle consumption of 100 per cent. This estimate was justified by the event, in that 6,200 litres (124,000 full "doses" of 50 c.c.) were prepared as compared with an average of 5,000 litres (100,000 "doses") in earlier seasons.

Although the season was in general successful, it was not uniformly so. Mention has already been made of the difficulty of filling vacancies in the subordinate technical staff with suitable Southerners. Fortunately on the other hand, the health of the under-strength Northern staff remained, for the first time, good.

Another fortunate feature was that the local cattle men refrained from striking throughout the season. These men, of whom about 100 are employed, are very shy workers, and have in the past been apt to strike without notice, often without ascertainable reason. They never obtained any concession, and in fact never seemed to want any - except perhaps a short rest. Nevertheless these strikes made for considerable disorganisation. Since a fair proportion of these men present themselves regularly year by year for employment, the Research Officer in charge offered to pay a very slightly higher wage to those who had been employed for five successive seasons on conditions that if they joined in any strike they would forfeit their bonus. As already stated, the measure proved entirely successful.

On the other hand, the annual difficulty of obtaining an adequate supply of suitable cattle became intensified. At the beginning of the season the establishment of serum producers was 80 under strength, and of the 300 required for the second half of the season none were in sight. Ultimately, however, with the help of the Governor, Upper Nile Province, most of the deficiency was made up. Nevertheless, over 120 head had to be imported from the Equatorial Province. The supply of small cattle, destined to act as virus producers, was in similar case. Over 600 were needed, of which the bulk were ultimately obtained within the Upper Nile Province through the agency of District Commissioners. As in earlier seasons, however, a breakdown was at one stage only avoided by importing small cattle from the White Nile Province.

The question of cattle supply may become a matter of even graver concern in the near future. With the substitution of cash taxation for tribute in kind, the help of the Governor and the District Commissioners, on which we have hitherto so greatly relied, and which has always been so freely given, must necessarily operate less directly in our favour. A few cattle, collected as fines, may still be received, but the great majority must henceforward be purchased through local merchants, and these, even with the most modest conception of what constitutes reasonable profit, cannot be expected to function perfectly from the outset. In addition to their lack of organisation, one must expect them to try to exploit the Government's need of the cattle, and the natives' ignorance of market values, in order to make the greatest possible profit. Contributory factors will be our increased requirement of cattle, and the relatively small sum required for the payment of taxes, since apart from these payments the local natives have little use for money.

Indications of such developments are already evident : of the 1,200 cattle required for the 1936-37 working season, 400 have had to be obtained from the Equatorial and White Nile Provinces, and it was only with considerable difficulty that a few hundred could be extracted from the first named, since the natives' requirements of cash are as low as in the Upper Nile. The advantages of being able to obtain supplies of cattle from the immediate vicinity of the laboratory are obvious, but although the Province in which it is situated carries a cattle population amounting to hundreds of thousands it is not yet possible, in spite of every assistance from the administrative staff, to secure them.

II. CATTLE PLAGUE VACCINE

This year, for the first time, an attempt was made to convert all available "raw material" into vaccine; most of this was provided by the Malakal Laboratory. The procedure has been to excise the spleens, lymphatic glands, thymuses and tonsils of virus producing bulls employed in the serum making process, to roughly mince them in a domestic meat mincer, add double the weight of 60 per cent. glycerine solution, and place in cold storage, for which a few oil-operated refrigerators are maintained. Each fortnight's accumulation at Malakal is sent to Khartoum in cold storage on the fortnightly mail steamer. In Khartoum the product is finely ground in a mechanical mill, a further unit of glycerine solution is added so as to make a tissue-solution

proportion of 1-3, and, after accumulating the largest practicable volume in order to compensate for variation in quality of individual consignments, finally bottled, etc. for issue.

At this stage the material, having been continuously maintained at a low temperature, is fully virulent, and will remain so for possibly three more months in cold storage. Since experiments have shown that three days' incubation at a temperature of 37°C will bring the material to the same degree of innocuity as it will arrive at after three or four months in cold storage, and, since it has further been found that the immunising qualities of the product also deteriorate more rapidly at a high than at a low temperature, a few thousand doses, sufficient only for immediate requirements, are incubated at 37°C for three days and further stored in the cold, while the bulk stock is maintained in cold storage throughout, or until some has to be withdrawn to supply immediate needs. By this means the "life" of most of the vaccine is prolonged by several weeks.

Although during the working season of the Malakal Laboratory the output of potential vaccine material is so rapid as to allow of a substantial reserve being built up in Khartoum, the total supply from this source is not sufficient for the year's requirements. More vaccine has, therefore, to be made in Khartoum from cattle previously used in other sections of the Laboratory's activities, and on occasion from cattle specially purchased for the purpose. It is, however, realised that, with a very much greater supply than the present one, demands would always absorb the output. Pending a full reconsideration of the country's policy of cattle plague control, therefore, it has been provisionally decided that so long as the existing budgetary vote for the purchase of cattle for all purposes is not exceeded, only so many beasts will be used for vaccine production as can be spared in consideration of other demands.

The dose of vaccine has been fixed at 1 gm. of original lymphoidal tissue per 100 kg. live weight of vaccinated beast. For most young adult cattle, therefore, a 10 c.c. dose is about the average required; smaller cattle receive less, while all large cattle destined for export receive a flat rate dose of 20 c.c. A total of 130,723 average doses was issued, as compared with 41,646 in 1935.

The vaccine has now been in use for a sufficiently long period to warrant some remarks on its efficacy under field conditions. Laboratory experiments had shown that the vaccine would produce a sound immunity in most cattle within three days, and complete immunity in all cattle within a week. The immunity, moreover, had been found to last for at least ten months (longest interval tested, and by no means the end-point) in nearly all cattle, although in a very few individuals the immunity might begin to wane at a somewhat earlier period. One would thus expect that following a vaccination campaign over a given area, or in a given herd, the vaccinated cattle would with very few exceptions be safe for one year; if cattle plague were introduced a few individuals might succumb, but nothing in the nature of an "outbreak" would be possible. Vaccinations have only been carried out in one large area in which the accurate keeping of detailed records has been possible, namely the Gezira, where 4,500 odd cattle belonging to tenants of the Sudan Plantations Syndicate and the Kassala Cotton Company were vaccinated in December 1935 and January 1936. Cattle plague has since made its appearance

on several occasions within the area and has taken its usual toll of unvaccinated cattle; of the 4,500 odd vaccinated cattle only nine have contracted the disease, namely seven at an interval of about seven months and two after about ten months from the date of vaccination. A few more may, of course, have developed symptoms of so mild a nature that they were not noticed.

Further testimony to the value of the vaccine comes from the cattle exported to Egypt. All these are automatically vaccinated when "registered" for export, registration occurring several weeks or a few months before export. From the time of registration to the time they enter the chain of export quarantine parks these cattle cannot be isolated from cattle plague. During the year over 10,000 cattle have been exported, and probably 13,000 or 14,000 registered. No case of cattle plague has been detected among them.

Although the vaccine is quite avirulent when injected, and although there is no doubt about its immunising properties, there has been one complaint that it is not safe to use. This complaint has come from the Blue Nile Province, where, out of one batch of 53 cattle vaccinated in June, ten died within a few days (two actually the next day) of vaccination, following the development of very large swellings at the site of injection. Vaccine of the same batch was used in other stations without ill effect, and a sample from a partly used bottle from the site of the accident was returned to Khartoum and found not only safe to inject but also by cultural methods found free from micro-organisms, with the exception of a few mould spores. It is therefore fairly certain that some local secondary infection, and not the vaccine, was responsible for the casualties. The foregoing was the only accident recorded during the year, and, serious though it no doubt appeared at the spot on which it occurred, the casualties, taking the country as a whole, represent less than one in 13,000 of vaccinated cattle, and in any case it does not seem that the vaccine itself was to blame.

III. CONTAGIOUS BOVINE PLEURO-PNEUMONIA VACCINE

There has been no change in the technique of preparing this product. Cultures of about 25 generations in subculture are tested on a few cattle. If found safe, as the result of a month's observation of the tested cattle, they are taken into routine use, and if not found safe they are subcultured a few more times and re-tested. Actually, a 20th generation is almost invariably found safe, but no strain of less than 25 subcultures is ever issued to the field. A strain is kept in use for a few months and then a new one is substituted.

During the year 51,740 doses have been issued as compared with 51,090 in 1935. Most of this has been used in nomad pastoral areas in which accurate records of its safety and usefulness cannot be kept. It appears, however, to be very popular and, although not guaranteed as either entirely safe or absolutely infallible, demands continue to increase.

The year has, however, not passed without accident. A strain of vaccine, tested and found safe as a twenty-third subculture, had been in routine use from a twenty-seventh to a forty-seventh, i.e. for twenty weeks, during which period about 15,000 doses had been issued without report of any untoward sequel. Issues of forty-seventh to fiftieth generations inclusive, to several stations, caused a considerable number of large swellings and several deaths. The *prima facie* explanation would appear to be that the strain had by some strange means recovered its lost virulence, but this explanation could not be accepted without proof. Failing an opportunity to investigate the point further, the strain was merely discarded.

IV. CAMEL TRYPANOSOMIASIS CONTROL

There has been no change in the technique of controlling camel trypanosomiasis. Diagnosis is effected by the Mercuric Chloride test, and positive reactors are treated with a single 5 gm. dose of naganol (in watery solution) intravenously. The 5 gm. dose was introduced in place of 4 gm. during 1935, the intention being to prolong the average period after treatment that camels would resist re-infection. It has not been possible to keep accurate records, but it is probable that in general the object has been achieved.

A total of 10,701 doses of naganol, and comparable quantities of accessories, were issued, as compared with 2,901, 4,219 and 10,081 in the three preceding years. Of the 10,701 doses of naganol issued, 8,854 were to private owners who paid for the treatment.

V. EXAMINATION OF SPECIMENS

A total of 543 specimens from external sources was examined (447, 452 and 585 in the three preceding years). As usual, most of these were of no particular interest, but the following are worthy of mention :-

1. Cryptococcus Infections.

Only one case out of 33 diagnosed was of interest, this being a lachrymal infection in a horse.

2. Globidium Infection.

Globidium spores were seen in a skin scraping from a horse in Kordofan. (It is to be noted that all the earlier cases that have been diagnosed in this country have been traced to Southern Kordofan).

3. Haemorrhagic Septicaemia.

This disease is rarely diagnosed in the Sudan, but this year two cases have been detected, one in a bull and one in a camel, both in Kassala Province.

/ 4. *Actinomyces*.....

4. Actinomyces Infections.

Smears of pus from a submaxillary abscess in a horse at Roseires (Upper Blue Nile) were found to contain a Gram-positive, mildly acid-fast actinomyces in pure culture. No fresh material was available for cultural study.

A bull slaughtered for food in Khartoum was found infected with Actinomyces farcinicus.

5. Tuberculosis.

Another extremely rare condition in the Sudan. Two slaughter cattle at Malakal were found with extensive generalised infection. These cattle were of the Southern longhorn type, an interesting observation in that it has recently been found in Uganda that the true African long horned beast is relatively highly susceptible as compared with the zebu.

6. Bovine Coccidiosis.

The justification of mentioning this condition is that it has not been mentioned before in these reports, and its existence in the Sudan is thus not on record. A specimen of faeces from a calf near Khartoum was found to contain a fairly heavy Eimeria infection. Although this is the first specimen received in the Laboratory from outside sources, the infection has frequently been noticed in laboratory animals, especially those suffering from cattle plague. It is probable that bovine coccidiosis is fairly widespread throughout the country.

7. Miscellaneous.

The following list includes less interesting diagnoses :-

Horses : Tryp.congolense, Tryp.brucei, epizootic lymphangitis, ulcerative lymphangitis, strangles, various septic and worm infections.

Mules : Microfilaria in blood, epizootic lymphangitis, various septic infections.

Donkeys: Epizootic lymphangitis, septic infections.

Camels : Tryp.soudanense, microfilaria, various worms.

Cattle : Tryp.congolense, Tryp.vivax, anaplasmosis, theileriosis.

Fowls : Fowl pox, spirochaetosis.

VI. AFRICAN HORSE SICKNESS

This disease is one of the conditions which, although troublesome in the Sudan, have not been of sufficient importance to justify the undertaking of research. The recent development of a "neuro-vaccine" in South Africa has, however, placed a weapon

at our disposal for combating it. This vaccine, which rapidly deteriorates on removal from cold storage, is now prepared in Kenya, and by arranging for consignments to be sent by air it can be successfully used in parts of this country which are close to the regular air routes.

Late in 1935 and early this year, in anticipation of this year's horse sickness season on the Gezira, 112 horses were vaccinated. The vaccinations could not be undertaken as early as might have been wished, and horse sickness was occurring before they were completed. Two vaccinated horses died, one after receiving first vaccine only and one two days after receiving the second. It is justifiable to exclude these from calculation since the vaccines had not been allowed sufficient time to produce immunity. Apart from these two cases no vaccinated horse has since died, although there have been many deaths throughout the area in unvaccinated ones.

The vaccines are believed to incorporate all known strains of horse sickness virus, but there is always the possibility that new types may come to light, the Sudan in particular being a possible source since no typing of local strains has been carried out. It would be a laborious and costly procedure to carry out a routine survey involving the typing of large numbers of samples of Sudan virus; furthermore, the procedure would not in any case be justified unless a certain amount of evidence were forthcoming that hitherto unknown types existed. It was therefore arranged with the Chief Veterinary Research Officer of Kenya that in the event of any horses vaccinated with his vaccine contracting the disease their virus should be sent to him for typing. If any new type were established, he would convert it into a neuro-virus in order to incorporate it in vaccine supplied to this country. As already stated, with the exception of two horses which on general immunological grounds can be excluded from calculation, no casualties occurred among those vaccinated. It thus seems probable that the vaccine incorporates all the strains of virus that occur on the Gezira.

An opportunity occurred for checking the immunity in one case. An unvaccinated horse succumbed to horse sickness at the same time as a vaccinated one became due for destruction on surgical grounds. The latter was therefore injected with blood from the former and another "clean" horse, also due for destruction, was included as a control. The vaccinated horse developed no symptoms, while the control died of horse sickness.

A few other horses in different areas were also vaccinated, all of which survived, but their numbers are too small for any further conclusion to be drawn.

The success of these vaccinations has been so great that nearly 300 demands from private owners have been received during the second half of 1936 for vaccination of their horses in anticipation of the 1936 - 37 horse sickness season. The vaccinations are being carried out, as before, on the payment of a fee that just covers the purchase price of the product and overhead expenses.

VII. HIDES

The method of curing flint-dry hides that is universally recommended.

recommended in the Sudan is to stretch the freshly tanned hide on a roughly constructed frame made of boughs of trees or whatever timber is locally available. A point is made of instructing producers that, provided the hide and frame are kept clear of the ground so as to allow free circulation of air to both sides of the hide, it does not greatly matter whether drying is carried out in the shade or in the sun; the faults of a sun-dried hide, in fact, are not due to drying in the sun but to drying on the ground, as most natives are in the habit of drying them.

The conservatism of the exporting merchants of Khartoum is, however, so great that they have continued to regard, and pay for, any hide as an inferior article if it had not actually been dried in the shade. A practical demonstration was therefore arranged for them. As a considerable number of heavy hides are annually saved by the Malakal Laboratory, it was arranged to dry one batch on frames in the shade and a parallel batch in the sun. Furthermore, since the Imperial Institute Advisory Committee on Hides and Skins had recently advocated an alternative technique of sun-drying (the pole and pegs suspension method, vide Bull. Impl. Inst., 1934, XXXII, 41) a further batch was simultaneously dried by this method. Finally, in order to provide controls showing the best that can be done in this country, a fourth batch was dry-salted. It was not considered necessary to peg a batch on the ground, as it is already common knowledge that a bad product results.

The four batches, each consisting of fifty hides, were sent to England to be tanned and criticised. The tanners' report was that the dry-salted hides, as was to be expected, were the best, followed, in order of quality, by those sun-dried on frames, those dried by the Advisory Committee's pole and pegs technique, and last those shade-dried on frames. The shade-dried batch were reported to suffer from "low grain", judged by the tanners to be the result of not having dried sufficiently quickly, which judgment was doubtless correct since the hides were cured just before the appearance of the rains, and the atmosphere at Malakal was not particularly dry. The hides sun-dried by the pole and pegs technique were reported as inferior to those stretched on frames as they "showed severe local damage, which we thought was due to the hides touching whilst being cured". This opinion again was undoubtedly correct, since it had been recorded in our experiments that hides drying suspended from poles curled back on themselves at the edges so that one part of the hide touched another. The tanners' final advice was: "If the method of curing by dry-salting is not possible owing to expense or to the lack of supervised slaughterhouses, we would recommend the method of sun-drying on frames, as the leather from hides cured in this way was definitely better than lots 33 and 44". (Numbers allotted to the shade-dried and pole - suspended lots respectively).

The foregoing report, if it has not yet entirely destroyed the exporters' suspicion of any kind of sun-dried hide, has at any rate lessened it, as it is shown by the high prices they are now paying for pieces sun-dried on frames.

VIII. INSTRUCTION

Instruction in the technique of flaying and curing hides has been continuously carried out in both the Khartoum and Malakal laboratories. In addition, at Malakal the Veterinary Inspector, Upper Nile Province, has been provided with office accommodation at the laboratory, founded upon which a small instructional centre is being built up. At present training is largely confined to demonstrating the breaking and harnessing of cattle for work, using the laboratory's cattle as demonstration subjects, but it is hoped to extend the range of instruction as fast as the local natives prove capable of benefiting from it.

C. RESEARCH

No deliberate research has been contemplated; in fact, as already stated, it has been officially abandoned. A few minor problems have, however, been given a certain amount of attention, but, with the exception of some observations on camel trypanosomiasis, there have been no developments worthy of report.

The observation in regard to camel trypanosomiasis is that a naturally occurring ablepharoplastic type of T.evansi has been detected in camels in the Sudan. Variation in the size of the blepharoplast (centrosome) had frequently been noticed in the Sudan, and in fact had long been regarded as normal, but the discovery of a strain completely devoid of this body, morphologically indistinguishable in fact from T.equinum, was made quite unexpectedly in 1934 when collecting material to send to Dr. C.A. Hoare of London. Since then three other camels, out of hundreds specially examined, have been found infected with a pure ablepharoplastic strain of trypanosome, but unfortunately these have been nomad-owned beasts, from which blood films have been sent to Khartoum, and no living camel so infected has been obtainable for further observation. The available material has been sent to Dr. Hoare for study, and a joint paper discussing partially or completely ablepharoplastic trypanosomes of the T.evansi group (T.hippicum, T.venezuelense, T.equinum) is in the press.

D. PUBLICATION

Three papers have been published during the year :-

BENNETT, S.C.J. Cattle Plague Vaccine. Studies on Glycerinised Spleen Pulp. - Jour. Comp. Path. & Therap., 1936, Vol.49, pp.1-48.

BENNETT, S.C.J. The Treatment of Equine Trypanosoma congolense infections with Surfen C (Bayer). - Jour. Comp. Path. & Therap., 1936, Vol.49, pp. 151-159.

EVANS, J.T.R. Trypanosome congolense infection in Cattle: Treatment by Antimosan and Surfen C - Jour. Comp. Path. & Therap., 1936, Vol.49, pp. 160-162.

E. SUMMARY.

The main feature of the year has been the official recognition that routine work has at last developed to a level that research must be deliberately abandoned. The abandonment of research has been followed by increased effort in routine production of biological products, in consequence of which the output of cattle plague serum rose from an average of 5,000 litres to 6,200 litres (100,000 to 124,000 full "doses") and that of cattle plague vaccine from 41,646 to 130,723. Issues of contagious bovine pleuro-pneumonia vaccine, in the case of which there has never been great difficulty in complying with demands, rose only from 51,090 to 51,740 doses. Issues of naganol and various accessories for the control of camel trypanosomiasis, in which all demands have always been satisfied, rose from 10,081 to 10,701 units. The number of specimens examined remained approximately unchanged.

In addition, both the Khartoum and Malakal laboratories gave continuous demonstrations of the approved method of curing flint-dry hides, and a training centre in animal husbandry was instituted at Malakal in collaboration with the local Veterinary Inspector.

The only research carried out was the preparation of a number of batches of hides dried in various ways, which were sent to England for tanners' trials. The outcome of this experiment was gratifying in that it showed that the method universally demonstrated and approved in this country is the best.

A new type of trypanosome, namely a naturally occurring ablepharoplastic form of T. evansi (soudanense) was discovered.

Three papers, reporting the results of earlier researches, were published in scientific journals.

Khartoum,
29-1-1937.

(Signed) S.C.J. Bennett.
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SAM.

